

REMARKS

This application has been reviewed in light of the Office Action dated June 2, 2005. Claims 31-37 are pending in this application, of which Claims 31 and 34 are in independent form. Favorable reconsideration is respectfully requested.

In the Office Action, Claims 31 and 33-37 were rejected under 35 U.S.C. § 103(a) as being obvious from U.S. Patent 6,657,665 (Guidash) in view of U.S. Patent 6,452,666 (Barna et al.); and Claim 32 was rejected under 35 U.S.C. § 103(a) as being obvious over Guidash, Barna et al., and further in view of U.S. Patent 5,892,541 ("Merrill").

In general, the present invention relates to a solid image pickup device having a pixel structure and including a charge transfer means provided between a photoelectric conversion unit and a charge-voltage conversion unit. The present invention addresses a specific technical problem in the pixel structure of such devices, that is, the problem that signal transfer from the photoelectric conversion unit to the charge-voltage conversion unit by the charge transfer means may not be fully performed, resulting in residual charges that are not transferred, due to a decrease in the voltage of the power source.

Claim 31 recites, *inter alia*, a method of driving a solid image pickup device, including a step of performing a primary transfer operation to transfer at least a part of the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to the charge-voltage conversion unit. At least one other transfer operation is performed, prior to a subsequent

charge accumulation period, to transfer remaining photoelectric charges from the photoelectric conversion unit to the charge-voltage conversion unit. The photoelectric conversion unit is not reset prior to the at least one other transfer operation.

These claimed features may be understood by referring, by way of example, to the specification at page 14, line 26, through page 16, line 25, which describes a charge accumulation, transfer, and readout sequence. As shown in Fig. 2, a primary transfer (e.g., at time period T_1) and at least one other transfer (e.g., at T_6) are performed prior to the start of a subsequent charge accumulation period (e.g., beginning after T_6). Each of these transfer steps transfers a portion of the charge in the photoelectric conversion element (see, e.g., Figs. 1C and 1E). The transfer steps are followed by readout steps (e.g., at T_3 and T_7). This configuration helps prevent charges from being left behind in the photoelectric conversion unit during a charge accumulation period, thereby improving the sensitivity of solid image pickup device and preventing an after-image in the device.

It should be noted that the reset operation indicated in Fig. 2 relates to the resetting of the floating diffusion region (e.g., 103), not the resetting of the charge accumulation region of the photoelectric conversion unit (e.g., 105), which in accordance with Claim 31, is not reset prior to the at least one other transfer operation (e.g., at T_6). Of course, the above is merely one specific embodiment, which in no way limits the scope of the claims.

Guidash relates to an amplification-type image sensor in which charges are transferred from pixels to charge conversion regions. Guidash includes a photogate photodetector 12 (PG) and transfer gate (TG) 23; floating diffusion (FD) 25; a reset

transistor 14; a reset drain 18; and a source follower input signal transistor 21 (SIG).

However, as admitted in the Office Action, nothing has been found in Guidash that would teach or suggest (1) “performing a primary transfer operation to transfer at least a part of the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to the charge-voltage conversion unit”; and (2) “performing at least one other transfer operation, prior to a subsequent charge accumulation period, to transfer remaining photoelectric charges from the photoelectric conversion unit to the charge-voltage conversion unit, wherein the photoelectric conversion unit is not reset prior to the at least one other transfer operation”, as recited in Claim 31.

Barna et al. is cited in the Office Action as remedying the deficiencies of Guidash. Applicant respectfully disagrees. Barna et al. relates to a method of determining a range of an object by emitting light toward a target and sensing light reflected in the target, using, *inter alia*, an array of photosensitive pixels. The pixels include a photosensitive element having a diffusion output buffered by a source-follower transistor and a pixel selection switch. Barna et al. discusses using different integration periods using a single pixel coupled to a readout circuit with a single integration stage. However, nothing has been found in Barna et al. that would teach or suggest (1) “performing a primary transfer operation to transfer at least a part of the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to the charge-voltage conversion unit”; and (2) “performing at least one other transfer operation, prior to a subsequent charge

accumulation period, to transfer remaining photoelectric charges from the photoelectric conversion unit to the charge-voltage conversion unit, wherein the photoelectric conversion unit is not reset prior to the at least one other transfer operation”, as recited in Claim 31.

Accordingly, Applicant respectfully submits that Claim 31 is patentable over the combination of Guidash and Barna et al.

Moreover, Applicant submits that a *prima facie* case of obviousness has not been made out as to claim 31. A *prima facie* case of obviousness requires that three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference(s) or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references when combined must teach or suggest all the claimed limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the Applicant’s own disclosure (M.P.E.P. § 2143). Further, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).

The pixel of Guidash is different from the pixel of Barna et al. in, among other things, that Guidash includes a charge transfer means for transferring the charges of the photoelectric conversion element to the charge-voltage conversion unit. In contrast, in Barna et al., the photoelectric conversion element is directly connected to the charge-

voltage conversion unit without interposing the charge transfer means therebetween.

Accordingly, there would be no motivation to combine Guidash with Barna et al. to (1) perform a primary transfer operation to transfer at least a part of the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to the charge-voltage conversion unit; and (2) perform at least one other transfer operation, prior to a subsequent charge accumulation period, to transfer remaining photoelectric charges from the photoelectric conversion unit to the charge-voltage conversion unit, wherein the photoelectric conversion unit is not reset prior to the at least one other transfer operation”, as recited in Claim 31.

Therefore, even if Guidash and Barna et al. were to be combined in the manner suggested by the Examiner, assuming such a combination would even be permissible, the result would not meet the terms of Claim 31.

A review of the other art of record has failed to reveal anything which, in Applicant’s opinion, would remedy the deficiencies of the art discussed above, as a reference against Claim 31.

Claim 34 recites features similar to those discussed above with respect to Claim 31. Specifically, Claim 34 recites that the solid image pickup device includes a control circuit for controlling the solid image pickup device to perform a primary transfer operation to transfer at least a part of the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to the charge-voltage conversion unit, and to perform at a least one other transfer operation, prior to a subsequent charge accumulation period, to transfer remaining

photoelectric charges from the photoelectric conversion unit to the charge-voltage conversion unit. The photoelectric conversion unit is not reset prior to the at least one other transfer operation.

Accordingly, Claim 34 is also believed to be patentable over the combination of Guidash and Barna et al.

The other claims in this application depend from one or the other of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing remarks, Applicant respectfully requests favorable reconsideration and the allowance of the present application.

Applicant's undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Leonard P. Diana", is written over a horizontal line.

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